estimates that between 1990 and 2165, in the U.S. alone 6.3 million fatal skin cancers, 299 million cases of non-fatal skin cancers, and 27.5 million cases of cataracts will be prevented because of the worldwide phase-out of ODSs. (EPA, OAR, November 1999) (Exhibit 1-30). These are estimated cumulative effects, so there are no data series or trends to evaluate.

No specific indicators have been identified at this time for human health effects of stratospheric ozone depletion.

1.4.4 What ecological effects are associated with stratospheric ozone depletion?

UV radiation in sunlight affects the physiological and developmental processes of plants. Even though plants have mechanisms to reduce or repair these effects and some ability to adapt to increased UV-B levels, UV radiation can still directly affect plant growth. It can also produce indirect effects such as changes in plant form, distribution of nutrients within the plant, timing of developmental phases, and secondary metabolism. These changes can be even more important than direct damage because of their implications for plant competitive balance, herbivory, plant diseases, and biogeochemical cycles (UNEP, 1994).

UV radiation can also affect aquatic life. UV exposure affects both orientation mechanisms and motility in phytoplankton, resulting in reduced survival rates for these organisms. Scientists have demonstrated a direct reduction in phytoplankton production as a result of ozone depletion-related increases in UV-B (DeMora, et al., 2000). Small increases in UV-B radiation have been found to cause damage in the early developmental stages of fish, shrimp, crab, amphibians, and other animals, the most severe effects being decreased reproductive capacity and impaired larval development. Animals higher on the food chain that depend on these organisms for food could, in turn, be affected (UNEP, 1994).

Increases in UV radiation could also affect terrestrial and aquatic biogeochemical cycles, and, as a result, alter both sources and sinks of greenhouse and chemically important trace gases. These potential changes would contribute to biosphere-atmosphere feedback that attenuates or reinforces the atmospheric buildup of these gases (UNEP, 1994). Synthetic polymers, naturally occurring biopolymers, and some other materials of commercial interest also are adversely affected by UV radiation, but special additives somewhat protect some modern materials from UV-B. Increases in UV-B levels nonetheless will likely accelerate their breakdown, limiting their usefulness outdoors (UNEP, 1994).

No specific indicators have been identified at this time to address the ecological effects associated with stratospheric ozone depletion.

1.5 Climate Change

The issue of global climate change involves changes in the radiative balance of the Earth–the balance between energy received from the sun and emitted from the Earth. This report does not attempt to address the complexities of this issue. For information on the $1.7 billion annual U.S. Global Climate Research Program and Climate Change Research Initiative, please find *Our Changing Planet: The Fiscal Year 2003 U.S. Global Climate Research Program* (November 2002) at www.usgcrp.gov and the *Draft Ten-Year Strategic Plan for the Climate Change Science Program* at www.climatescience.gov.